Chapter 38
Tellurium Thin Films in Sensor Technology

Dumitru Tsiulyanu

Abstract An extensive review of the application of tellurium thin films in sensor technology is reported and discussed. Along with the traditional use of Te films in photo and strain sensitive devices, their modern application in chemical gas sensors is considered in detail. Fabrication parameters such as the technology of preparation, the substrate material, the thickness and morphology of the samples are shown to influence the response to gases. The effect of these parameters as well as that of temperature and thermal treatments on sensitivity, response and recovery times is discussed with respect to the structural evolution of the films, studied by SEM, XRD and XPS analyses. Further, the characterization of Te thin films for the detection of NO_2, NH_3 and H_2S as well as their cross-sensitivity to the main components of the atmosphere (O_2, N_2 and H_2O vapor) at different temperatures is given. The sensing mechanism is explained and the state of the art in the development of Te-based gas sensors operating at room temperature is considered.

Keywords Sensor technology · Tellurium films · Gas sensors · NO_2 · NH_3 · H_2S

Introduction

Polycrystalline tellurium thin films were the subject of many investigations in the past due to their interesting electrical [1,2] and optical [3] properties. One of the advantages of Te films over compound semiconductors in sensor and other device applications is the exemption from stoichiometry problems. This advantage allows the use of a large variety of methods for their preparation including thermal evaporation, sputtering, chemical precipitation and hot wall epitaxy. Tellurium films show p-type conduction due to lattice defects acting as acceptors; the band

D. Tsiulyanu (✉)
Department of Physics, Technical University of Moldova, bul. Dacia 41,
MD-2060 Chisinau, Moldova
e-mail: tsiu@molddata.md

J.P. Reithmaier et al. (eds.), *Nanotechnological Basis for Advanced Sensors*,
NATO Science for Peace and Security Series B: Physics and Biophysics,
DOI 10.1007/978-94-007-0903-4_38,